

## REMARKS

In the above-noted Office Action, claims 1-4, 6, 7, 9 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Palazzolo, et al (US 5,691,004) in view of Alkhimov et al (US 5,302,414), Shepard (US 2,588,422) and Marantz et al (U.S. 5,714,205).

Claims 20, 21, 23 and 24 were rejected based upon the above noted combinations and further in view of Gorynin et al (US 5,362,523).

With this amendment, claims 1 and 24 have been amended. Reexamination and reconsideration of the non-allowed claims are respectfully requested.

With respect to the rejection of claim 1, Applicants respectfully submit that the proposed combination of Palazzolo, Alkhimov, Shepard and Marantz fails to teach or make obvious Applicants' invention as represented by amended claim 1. None of the above references provide a method wherein the cylinder bores are sprayed with an aerodynamically focused, gas dynamic cold spray. With the aerodynamic focusing method provided by Applicants' invention, the spray of particles is concentrated to a smaller diameter. Therefore, even greater detail and accuracy can be obtained in achieving a uniform coating. The aerodynamic focusing is achieved by slowing down the particle laden gas stream after they have departed the particle mixer 24 and before they have entered into the supersonic nozzle. As the gas carrying solid particles converges toward the centerline upstream of the constriction, particles are accelerated toward the centerline axis by radially inward component of the flow. As the gas decelerates radially, inertia causes the solid particles to continue to move toward the centerline. The expansion of flow as it exits the constriction is more gradual and the particles are not strongly accelerated away from the centerline. The net result is that the particles downstream of the aerodynamic focusing constriction occupy a stream line closer to the centerline than the stream line they occupied upstream of the aerodynamic constriction. Therefore, maximum control and impact of the particles can be obtained.

Nothing in any of the above combinations brings forth this aerodynamic focusing feature. Furthermore, one knowledgeable of Alkhimov would be lead away from the teachings of Shepard, Marantz or Palazzolo. Palazzolo describes a thermal spraying technique which requires that the cylinder bore be honed and that the bore be washed with an

alkaline solution. Palazzolo also requires a thermal spray wherein dripping may occur if the spraying technique is not properly controlled.

Alkhimov provides a gas dynamic spraying method but fails to teach or disclose the enhanced control and refined technique and better product achieved with aerodynamic focusing. Therefore, greater modifications must be made in gas density, gas temperature, gas composition or gas pressure when spraying particles having different sizes to insure quality results.

The aerodynamic focusing is even more critical when one considers that in Applicants' invention, the spray material sprayed at an angle could cause further degradation in quality.

The Examiner stated that Shepard teaches a process similar to Palazzolo in which a lining material is applied to an aluminum cylinder bore by thermal spraying. The spray nozzle is advanced co-axially into the cylinder and the nozzle sprays at an angle approximately 40 degrees. However, although Shepard may teach using a metal spray at an angle, it addresses a different problem than Applicants' invention.

In Shepard the middle spray, due to its temperature, adheres to the cylindrical surface. In Applicants' invention of a cold spray, the greatest concern is that of bouncing off the particles from the surface. Therefore, one knowledgeable in Alkhimov would not look at Shepard since Shepard does not share the same particular problem in relation to the bouncing off of solid particles versus the drip of a liquid particle.

The addition of Marantz would further complicate the combination. Marantz utilizes a plurality of nozzles to send forth a plurality of radially extending sprays. Marantz does not bring forth a rotatable nozzle as does Applicants' invention.

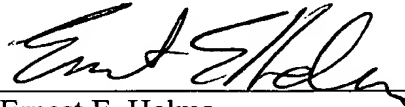
The rejections of claims 20 and 24 rely upon the addition of Gorynin to the above noted combinations. It is further submitted that Gorynin will further teach away from Applicants' invention. Gorynin achieves control by delivering the powders of metal to cool a hot zone of a plasma torch to achieve different exit velocities from the torch. Such a control strategy would be immensely complex as compared with Applicants' invention.

Applicants help achieve control by using aerodynamic focusing, a feature not part of any of the above combinations. In many, of not most applications of Applicants' invention high exit velocities are desired; therefore any control strategy which would modify exit velocities from being high would be undesirable.

Additionally, in many circumstances, Gorynin would require the use of inert or specialized atmospheres, teaching away from the intent of Applicants' invention.

Applicants have shown that the Examiner's rejections are respectfully traversed. As the application is otherwise in condition for allowance, such action is respectfully requested.

Respectfully submitted,



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